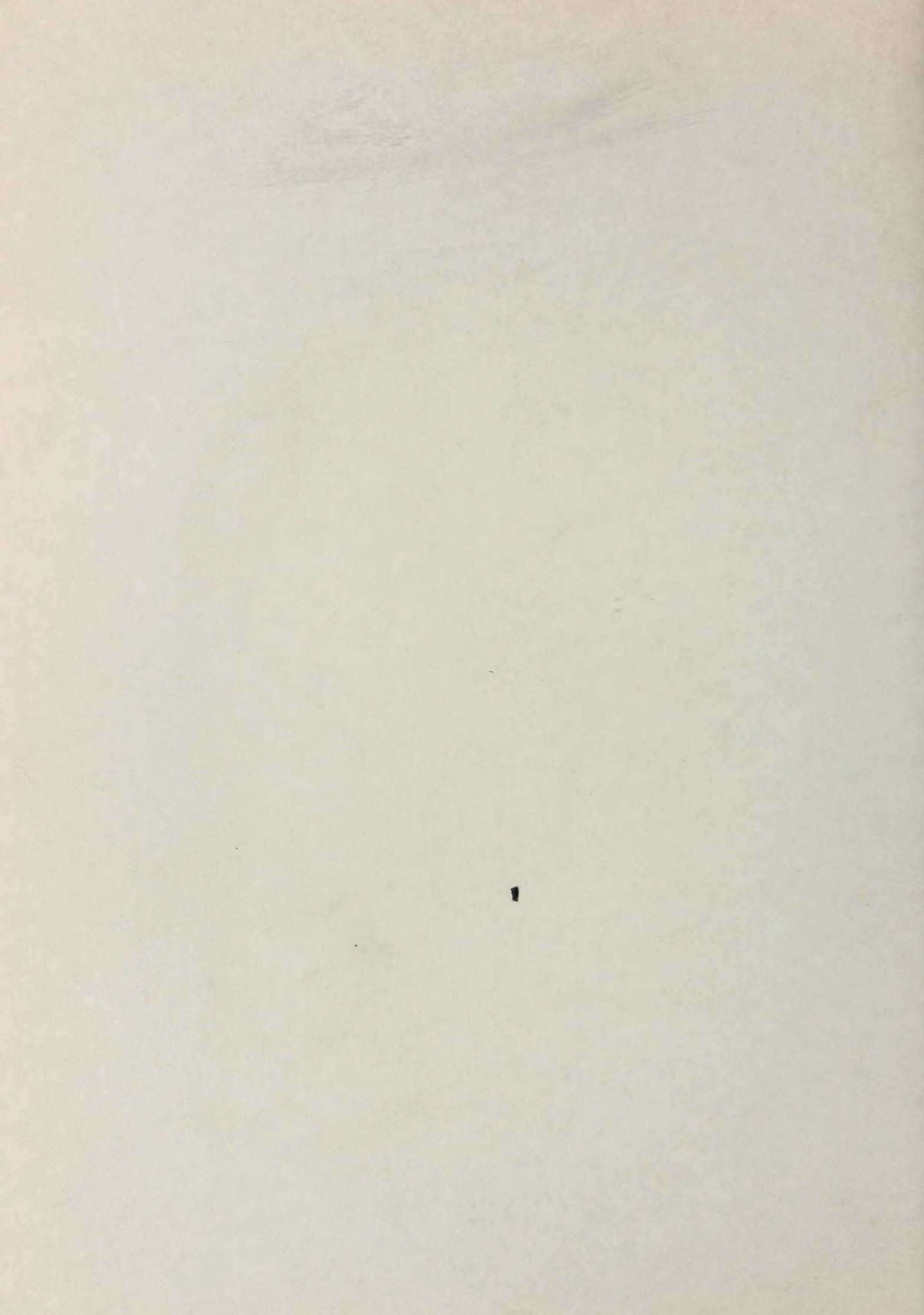


Historic, archived document

Do not assume content reflects current
scientific knowledge, policies, or practices.



622
2T22
p.2

TECHNICAL PAPER No. 74
1962

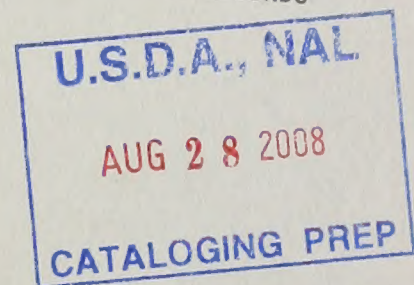
Automatic processing of timber appraisal cruises

Robert M. Miller
Sharon D. Roof

U. S. DEPT. OF AGRICULTURE
NATIONAL AGRICULTURAL LIBRARY

JUN 19 1963

CURRENT SERIAL RECORDS



PACIFIC SOUTHWEST
FOREST AND RANGE
EXPERIMENT STATION
BERKELEY, CALIFORNIA

FOREST SERVICE - U. S. DEPARTMENT OF AGRICULTURE

AUTOMATIC PROCESSING OF TIMBER APPRAISAL CRUISES

By

Robert M. Miller
Research Forester

and

Sharon D. Roof
Mathematician

Contents

Page

Objectives.	1
Input to the Program.	2
Computing Options	4
Output From the Program	4
Output Options.	7
Program Restrictions.	7
Operating Time.	8
Operating Instructions.	8
Appendix.	9

Technical Paper No. 74

1962

U.S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE
PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION
Berkeley, California

AUTOMATIC PROCESSING OF TIMBER APPRAISAL CRUISES

By

Robert M. Miller
Research Forester

and

Sharon D. Roof
Mathematician

A system for compiling timber appraisal cruise data using punched cards and electric accounting machines was developed in 1955 for the Division of Timber Management of the California Region, U.S. Forest Service.^{1/} This system follows the plan for compiling timber sale cruise data specified in the Region's Timber Appraisal Handbook (FSH-2425-R5). It was designed to produce a more accurate result at less cost than could be done by hand methods.

The increased number of appraisal cruises has created a need for an even more economical and faster method of producing the results. To satisfy this need, a program has been developed for the IBM 704 and 7090 computers which will produce summary tables of volume, value, and overrun factor for the average appraisal in less than 10 minutes.^{2/} This timber appraisal program follows the regular compilation procedures of the Forest Service in the California Region^{3/} to produce the average value per M-foot lumber tally, and the average overrun factor of the utilized log volume and the utilized and unutilized log volumes for each species. These summaries may be produced for both cut and leave trees by processing each type of tree as a separate species file.

Objectives

The computer program is designed to meet the needs of the timber appraiser for volume, value, and overrun of the species having net volume taper tables. These species are ponderosa pine, sugar pine, white fir, California red fir, Douglas-fir, and incense-cedar.

Normally only the cut trees are processed, but leave trees can be processed during the same run. More than one appraisal or several parts of one appraisal can be processed during the same run by presenting the data as separate species files.

^{1/} Miller, Robert M., Plan for compilation of timber appraisal cruise data for Division of Timber Management, Region 5. U.S. Forest Serv. Calif. Forest & Range Expt. Sta. 47 pp. 1955.

^{2/} The University of California Computer Center provided the computers used in compiling and debugging the program which was coded by Sharon D. Roof.

^{3/} U.S. Forest Serv. Timber Appraisal Handb., FSH2-2425-R5.

Complete flexibility is maintained in processing by using the species file concept of program control during input, computing, and output.

The specific objectives of the program are to compile, summarize, and print and/or punch:

1. The Scribner board foot net volume log scale of utilized and unutilized logs by
 - a. Species, log grade, and 4-inch diameter inside bark (d.i.b.) group
 - b. Species and log grade
 - c. Species and 4-inch d.i.b. group (printed only)
 - d. Species
2. The average value per M feet lumber tally of the utilized logs by
 - a. Species and log grade
 - b. Species
3. The average overrun factor (net volume lumber tally/net volume log scale) for the utilized logs by
 - a. Species and log grade
 - b. Species and 4-inch d.i.b. group (printed only)
 - c. Species
4. The Scribner bd. ft. net volume lumber tally of utilized logs by
 - a. Species, log grade, and 4-inch d.i.b. group (punched only)
 - b. Species and log grade
 - c. Species
5. The value of net utilized volume lumber tally by
 - a. Species, log grade, and 4-inch d.i.b. group (punched only)
 - b. Species and log grade
 - c. Species and 4-inch d.i.b. group (printed only)
 - d. Species

Input to the Program

Data are submitted to the IBM 704 Computer for processing in three types of punched cards:^{4/}

1. Control cards
 - a. The Species Control Deck No. 90 contains the data which informs the program of the objective items to compute, the output desired, the mill study sales realizations

^{4/} The card decks are described in the Appendix, Section 6.

being used, and the number of log grades to be encountered for the species. One control card No. 90 must be used for each species file (group of cards for the cut trees or the leave trees of each species) being processed in a run.

- b. An End of File blank card must be used to signal the end of each species file.

2. Master cards

- a. The regional overrun percents are contained in the Overrun Deck No. 95. There must be a total of 20 cards, one for each 4-inch d.i.b. group from 6 to 9 inches through 82 to 85 inches. Each card contains the overrun percents for the six main commercial species.
- b. The Log Net Volume Deck No. 97 contains the Scribner bd. ft. net log scale for 16-foot logs by 1-inch d.i.b. for the six main commercial species. There must be a total of 80 cards, one for each 1-inch d.i.b. from 6 through 85 inches.
- c. The regional sales realizations based upon lumber tally selling prices are punched into the Average Value Deck No. 98. There must be a total of 20 cards, one for each 4-inch d.i.b. group from 6 to 9 inches through 82 to 85 inches. Each card contains the average value per M feet for a possible nine log grades (grades 0, 1 through 8). The Deck No. 98 is required as part of the input data for a species file only when the values are to be computed, as specified in the Species Control Card No. 90.

3. Data cards

- a. The basic timber appraisal cruise data for each tree will be punched into the Tree Deck No. 29. One card must be prepared for each tree that is to be processed. Each tree is identified by National Forest, working circle, and other area identifiers; type of marking; strip and plot number; and several tree control items including 2-inch diameter at breast height (d.b.h.), total height in 16-foot logs, log grade and net volume of each log, and the number of utilized logs.

The master data in the Overrun Deck No. 95 and in the Log Net Volume Deck No. 97 are read into the computer once for each run. The control data in the Species Control Card No. 90, the master sales realization data in the Average Value Deck No. 98, the tree data in the Tree Deck No. 29, and the End of File blank card must follow in order for each species file that will be compiled in one run. Each species file will be calculated separately.

Computing Options

The machine can be instructed to compute values for selected objectives through use of the Execution Control Code (ECC) in the Species Control Card No. 90, as follows:

- ECC 0 --Compute Scribner bd. ft. net volume log scale of utilized and unutilized logs as in objective 1.
- ECC 1 --Compute Scribner bd. ft. net volume log scale of utilized and unutilized logs, and total value and average value per M feet lumber tally of the utilized logs as in objectives 1, 2, and 5.
- ECC 2 --Compute Scribner bd. ft. net volume log scale of utilized and unutilized logs, Scribner bd. ft. net volume lumber tally of utilized logs, and average overrun factors for utilized logs as in objectives 1, 3, and 4.
- ECC 3 --Compute Scribner bd. ft. net volume log scale of utilized and unutilized logs, Scribner bd. ft. net volume lumber tally of utilized logs, total value, and average value per M feet lumber tally of utilized logs, and average overrun factors of utilized logs as in objectives 1, 2, 3, 4, and 5.

Output From the Program

The summary data are output from the computer in printed and/or punched form as specified for each species file:

1. Printed output

The summary data for a species file will be printed when called for in the Species Control Card No. 90. Two tables will be produced; one for the utilized logs, and the other for the unutilized logs of each species file.

- a. Appraisal summary data for utilized logs: net volume log scale, net volume lumber tally, value lumber tally, and overrun factors by species, log grade, and 4-inch d.i.b. group. (Table 1 is an example of the output data for utilized logs.)
- b. Appraisal summary data for unutilized and cull logs: net volume log scale, by species, log grade, and 4-inch d.i.b. group. (Table 2 is an example of the output data for unutilized and cull logs.)

2. Punched output^{5/}

The compiled data for a species file can be punched into cards as the only type of output, or cards can be punched in combination with the printed tables. These options are exercised

^{5/} The card decks are described in the Appendix, Section 6.

Table 1.--Output data for utilized logs

VOLUME TABLES (BOARD FEET)											
NATIONAL FOREST 10			UNIT 01		WORKING CIRCLE 7		ZONE 3		CUT/LEAVE 1		
SPECIES 13											
UTILIZED LOGS											
LOG GRADE 1/											
DIB ITEM	0	1	2	3	4	5	6	7	8	TOTAL 2/	PER CENT 3/ VALUE 4/
2-5	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6-9	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10-13	0.	0.	0.	450.	420.	0.	0.	0.	0.	870.	64.01
14-17	0.	0.	0.	250.	2350.	0.	0.	0.	0.	2600.	199.54
18-21	0.	0.	0.	200.	2130.	0.	0.	0.	0.	2330.	18.97
22-25	0.	0.	0.	0.	2040.	0.	0.	0.	0.	2040.	16.61
26-29	0.	0.	0.	0.	1540.	0.	0.	0.	0.	1540.	12.54
30-33	0.	0.	0.	0.	1290.	0.	0.	0.	0.	1290.	10.50
34-37	0.	0.	0.	0.	1610.	0.	0.	0.	0.	1610.	13.11
38-41	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
42-45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
46-49	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
50-53	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
54-57	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
58-61	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
62-65	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
66-69	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
70-73	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
74-77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
78-81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
82-85	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL 5/	0.	0.	0.	900.	11380.	0.	0.	0.	0.	12280.	
VALUE 6/	0.	0.	0.	69.40	1037.83	0.	0.	0.	0.	1107.23	
AVE V 7/	0.	0.	0.	77.11	91.20	0.	0.	0.	0.	90.17	
OVER 8/	0.	0.	0.	952.	11353.	0.	0.	0.	0.	12305.	
AVE O 9/	0.	0.	0.	1.058	0.998	0.	0.	0.	0.	1.002	

^{1/} Volumes in the body of the table are total net volume log scale, Scribner bd. ft., by log grade and 4-inch d.i.b. group.

^{2/} Total net volume, log scale, Scribner bd. ft., by 4-inch d.i.b. group.

^{3/} Average overrun percent by 4-inch d.i.b. group.

^{4/} Total value lumber tally by log grade and average for the species.

^{5/} Total net volume log scale, Scribner bd. ft., by log grade and total for the species.

^{6/} Total value lumber tally by log grade and total for the species.

^{7/} Average value per M feet, lumber tally, by log grade and average for the species.

^{8/} Total net volume lumber tally, Scribner bd. ft., by log grade and total for the species.

^{9/} Average overrun factor by log grade and average for the species.

Table 2.--Output data for unutilized and cull logs

DIB ITEM	UNUTILIZED LOGS										SPECIES 13	
	LOG GRADE ^{1/}	0	1	2	3	4	5	6	7	8	9	TOTAL ^{2/}
2-5	-0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
6-9	0.	0.	0.	0.	400.	0.	0.	0.	0.	0.	60.	460.
10-13	0.	0.	0.	0.	0.	120.	0.	0.	0.	0.	0.	120.
14-17	0.	0.	0.	0.	0.	140.	0.	0.	0.	0.	0.	140.
18-21	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
22-25	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
26-29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
30-33	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
34-37	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
38-41	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
42-45	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
46-49	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
50-53	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
54-57	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
58-61	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
62-65	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
66-69	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
70-73	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
74-77	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
78-81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
82-85	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
TOTAL ^{3/}	0.	0.	0.	0.	400.	260.	0.	0.	0.	0.	60.	720.

^{1/} Volumes in the body of the table are total net volumes log scale, Scribner bd. ft., by log grade and 4-inch d.i.b. group.

^{2/} Total net volume log scale, Scribner bd. ft., by 4-inch d.i.b. group and total for the species.

^{3/} Total net volume log scale, Scribner bd. ft., by log grade and total for the species.

by the program as directed in the Species Control Card No. 90. Three types of punched cards are available as output from the program.

- a. Species/Log Grade/DIB Group Volume and Value Summary Deck No. 43. One card No. 43 will be punched for each 4-inch d.i.b. group of each log grade of the utilized logs and the unutilized logs of a species file. Each card No. 43 will contain the area and volume identification data, the total net volume log scale and lumber tally, and the total value, lumber tally, for the log grade/d.i.b. group.
- b. Species/Log Grade Volume and Value Summary Deck No. 44. One card No. 44 will be punched for each log grade of the utilized logs and the unutilized logs of a species file. Each card No. 44 will contain the area and volume identification data, the total net volume log scale and lumber tally, the total value and average value per M feet lumber tally, and the average overrun factor for the log grade.
- c. Species Volume and Value Summary Deck No. 45. One card No. 45 will be punched for the summary of the utilized and the unutilized logs of a species file. Each card No. 45 will contain the area and volume identification data, the total net volume log scale and lumber tally, the total value and average value per M feet lumber tally, and the average overrun factor for the species.

Output Options

The Output Control Code (OCC) in the Species Control Deck No. 90 provides for selected output of the computed summary data as follows:

- OCC 1 = Print tables 1 and 2.
- OCC 2 = Punch deck Nos. 44 and 45.
- OCC 3 = Punch deck Nos. 43, 44, and 45.
- OCC 4 = Print tables 1 and 2, and punch deck Nos. 43, 44, and 45.

Program Restrictions

Certain restrictions and limitations must be observed for correct operation of the program.

1. Each log must be graded for each tree of the species for which net volume taper tables are available. These log basis species are ponderosa pine, sugar pine, white fir, California red fir, Douglas-fir, and incense-cedar. If log grades are not usually used for a species in an area, then the same grade-code should be used for all logs except cull logs and missing logs.
2. Sales realization values must be present in the Deck No. 98 for each possible log grade of a species. The full range of

log d.i.b. groups must be accounted for. The sales utilization values will be taken as zero if they are not otherwise punched in the Deck No. 98. There must be 20 cards of the Deck No. 98 for each species file.

3. The log grade and the log net volume must be punched into each card of the Tree Deck No. 29 for each log in the tree, including utilized, unutilized, cull, and missing logs; and the number of utilized logs also must be punched. Missing values for any of these items will be treated as zero values by the program.
4. There must be 20 cards of the Overrun Deck No. 95 for each run.
5. There must be 80 cards of the Log Net Volume Deck No. 97 for each run.
6. The tree and log data in the Tree Deck No. 29 must fall within the range of control and master data values in the Deck Nos. 90, 95, 97, and 98.

Operating Time

The time required on the IBM 704 to compute all values and to print tables 1 and 2 off-line varies from a maximum of about $2\frac{1}{2}$ minutes for a single species file down to about 30 seconds per species file when many species files are processed in one computer run. Punching on-line of the Deck Nos. 44 and 45 requires a maximum of about 3 minutes for a species file. On-line punching of the Deck Nos. 43, 44, and 45 takes a maximum of about 12 minutes for a species file. Off-line punching of the card decks requires a maximum of about 30 seconds to write tape, in addition to the compute time.

The time required on the IBM 7090 to compute all values and to write the tapes for off-line printing of tables 1 and 2, and to punch Deck Nos. 43, 44, and 45 is less than 50 seconds per species file.

Operating Instructions

The operating instructions for this IBM 704 or 7090 FORTRAN MONITOR program, the FORTRAN source program deck, and the binary object program deck may be obtained by writing to the Director, Pacific Southwest Forest and Range Experiment Station, U. S. Forest Service, P. O. Box 245, Berkeley 1, California.

Appendix

Data Processing Procedures

The procedures to be followed in recording and processing timber appraisal cruise data are outlined in the following sections.

1. Source document

- 1.1 The appraisal cruise data will be recorded in code on the Timber Appraisal Cruise Record (Form R5 2400-28) (fig. 1).
- 1.2 Edit the Timber Appraisal Cruise Record for legibility, completeness, and accuracy.
 - 1.21 The identification and control data in the heading should be complete.
 - 1.22 Plots should be numbered consecutively with no duplications or misses; the site class must be coded for each plot.
 - 1.23 Codes must be present for all trees for the items: species, d.b.h., and total log height.
 - 1.24 Log grade codes:
 - (a) A log grade code must be present for each log of each tree that will be computer processed.
 - (b) The total number of logs graded must agree with the total log height of each tree that will be computer processed.
 - (c) Coast range Douglas-fir No. 2 sawlogs must be coded as grade 5 and the No. 3 sawlogs must be coded as grade 6.
 - (d) All Douglas-fir logs (to be computer processed) for appraisals in which the Westside Index price is to be used must be coded grade 7, except for the code 9 cull and missing logs.
 - (e) All incense-cedar logs to be computer processed must be coded grade 7, except for the code 9 cull and missing logs.
 - 1.25 Condition class and age class must be coded for appraisals where tree volumes will be summarized by these items.
 - 1.26 The cut/leave code must be present for each tree.

TIMBER APPRAISAL CRUISE RECORD

20 Ch. N. of SE. Cor.

Unit XX 01 Strip No. XX 13 Location 515, run West
National Forest XX 18 T 29N R 10W S 15 40 - Marking XX 02
Working Circle X 2 Date 5/30/62 Plot Size 1/4 acre
Block X 1 Crew DPB, IBM

Plot No.	Site Cl.	Species	DBH	Tot. Log Height	Log Grade by Log Position													Cond. Cl.	Age Cl.	C/L	Defect	T.S.I. Data and Remarks
					1	2	3	4	5	6	7	8	9	10	11	12	13					
XX	X	XX	XXX	XX	X	X	X	X	X	X	X	X	X	X	X	X	X	XX	X	X	XX	
01	2	11	038	06														24	1	2		
		11	032	06	2	2	4	---	4										1	1		
		11	050	08															1	2		
		11	040	07															1	9		
02	1	11	050	09														23	1	2		
		11	050	09	9	1	2	2	4	---	4								1	1		
		11	054	09	1	2	2	4	---	4		9							1	1		
		31	014	01															2	2	00	
03	1	51	048	05	7	---	7	9										24	1	1		
		51	014	02															2	2		
		31	018	02															2	2	00	
		11	078	12	1	1	2	---	2	4	---	4	9	9					1	1		
04	1	13	064	11	1	---	1	2	2	4	---	4						23	1	1		
		11	040	07															1	2		
		13	054	10	1	1	2	2	4	---	4								1	1		
05	1	31	032	05	2	3	---	3	9									13	1	1	08	
		31	018	03															2	2	00	
		31	042	08	9	1	2	3	---	3	9								1	1	15	
		32	036	06															1	2	00	
06	1	01	050	10	1	2	3	3	6	---	6							11	1	1	04	
		01	050	10	1	2	2	3	3	6	---	6							1	1	01	
		01	046	08	3	3	5	---	5	6	6								1	1	02	
		01	018	04															2	2	00	
		01	038	07	9	3	5	5	6	6	9								1	1	04	

X Indicates number of digits in Item Code.

Figure 1.--Example of coded source document.

- 1.27 The defect class must be present for each Douglas-fir and white and red fir when tree volumes are to be determined from the Kimmey Cull Factor net utilized volume tables.

2. Prepare data cards

- 2.1 Punch and verify the Tree Deck No. 29 from the Timber Appraisal Cruise Record.
- 2.11 Punch defect code for DF-01, WF-31, or RF-32 into columns 31 and 32. These columns will be left blank for all other species.
- 2.2 Reproduce the Tree Deck No. 29 for DF, WF, and RF, if defect code was punched into columns 31 and 32.
- 2.21 Select the cards of Deck No. 29 for DF, WF, and RF.
- 2.22 Gang punch an X into columns 1 and 60 of the selected cards which will be referred to as the Fir Tree Deck No. 29X1. Keep them separate from the main Deck No. 29.
- 2.23 Reproduce a Deck No. 29 from the Deck No. 29X1. Do not reproduce the X punches in columns 1 and 60, nor the defect codes in columns 31 and 32.
- 2.24 Combine the reproduced cards No. 29 for DF, WF, and RF with the cards of Deck No. 29 for the other species. Keep the Deck No. 29X1 separate.
- 2.3 Gang punch the volumes into the Tree Deck No. 29.
- 2.31 Merge the Log and Tree Volume Master Deck No. 91 (P)^{6/} and the Tree Deck No. 29 (S)^{7/} on zone/site group/species/2-inch d.b.h./log height, and gang punch and compare the log and tree volumes from Deck No. 91 into Deck No. 29.
- 2.32 Make certain that every log in every tree has a volume.
- 2.4 Gang punch the volumes into the Deck No. 29X1.
- 2.41 Merge the Fir Net Utilized Volume Deck No. 92 (P) and the Fir Tree Deck No. 29X1 (S) on site group/species/2-inch d.b.h./log height/defect code and gang punch and compare the tree volume from Deck No. 92 into Deck No. 29X1.

^{6/} P = collator primary feed.
^{7/} S = collator secondary feed.

2.42 File the Deck No. 29X1 for later use.

2.5 Machine edit the Tree Deck No. 29. (Corrections also must be carried over into the Fir Tree Deck No. 29X1.)

- (a) Unit. The same code should be present in all cards.
- (b) National Forest. The same code should be present in all cards.
- (c) Working Circle. The same code should be present in all cards.
- (d) Block. Only the codes specified for the blocks in that Working Circle may be present.
- (e) Plot. If coded, make certain that a legal code is present in each card.
- (f) Site. Make certain that a legal site group code is present in each card.
- (g) Species. Codes other than 01-DF, 11-PP, 13-SP, 31-WF, 32-RF, and 51-IC should be questioned.
- (h) 2-inch d.b.h. Must be $\geq$ 012. Diameter greater than 100 are possible but should be questioned.
- (i) Total Log Height. Must be in the range of 01 through 13.
- (j) Log grades. Make certain that the proper log grade codes were used for the species. Then make certain that all logs in the trees to be computer processed have grade codes and volumes. Finally make certain that the log (volume) is of the proper size to be within its coded grade for the species.
- (k) Condition class. If coded, make certain that the combination of codes is legal and that a code is present in all cards.
- (l) Age class. If coded, make certain that the code is legal and that a code is present in all cards.
- (m) Cut/leave. Make certain that a legal code is present in all cards.
- (n) Defect. If coded, this item should be present in the Deck No. 29X1 only. Make certain that a legal code is present in each card No. 29X1.

3. Prepare computer input

3.1 Species Control Deck No. 90. Punch and verify one card No. 90 for each species file of cards to be processed in a computer run. A file of cards is defined as the group of cut tree cards or the group of leave tree cards for each species to be computer processed. The group of cards may be for any combination of NF/WC/block/unit of an appraisal or appraisals.

3.2 Ordering the input decks

3.21 Master decks

3.211 Overrun Deck No. 95. There must be 20 cards in the Deck No. 95. Order them by 4-inch d.i.b. group code.

3.212 Log Net Volume Deck No. 97. There must be 80 cards in the Deck No. 97. Order them by 1-inch d.i.b. class.

3.213 Average Value Deck No. 98. There must be a total of 20 cards in the Deck No. 98 for each species file for which values are to be computed, as specified in the Species Control Card No. 90. Order the Deck No. 98 by zone/species/4-inch d.i.b. group code.

3.22 Species Control Deck No. 90. There must be one card No. 90 for each species file to be computer processed. Order the Deck No. 90 by species for each group combination of NF/WC/block/unit/cut or leave.

3.23 Tree Deck No. 29.

3.231 Select the cards of the Deck No. 29 for the log basis species (01-DF, 11-PP, 13-SP, 31-WF, 32-RF, and 51-IC) which are to be computer processed.

3.232 Place the selected log basis species cards No. 29 in computer processing groups. There may be one or more groups.

3.233 Order each group of selected log basis species cards No. 29 by species.

3.3 Merging and final order of input decks

3.31 Merge the input decks--each group separately.

- (a) Deck No. 90 (P)^{8/} and Deck No. 98 (S)^{9/} on species.
- (b) Deck Nos. 90 and 98 (P) and Deck No. 29 (S) on species.
- (c) Place a blank card behind the last card No. 29 of each species.
- (d) Place the Deck No. 95 behind the Deck No. 97.
- (e) Place the Deck Nos. 97 and 95 in front of the merged Deck Nos. 90, 98, 29, and blank cards.

^{8/} P = collator primary feed.
^{9/} S = collator secondary feed.

- (f) Place the program Deck in front of all other cards.

3.32 Final order of input decks for a computer run

- (a) Program deck
- (b) Deck No. 97
- (c) Deck No. 95
- (d) Species file consisting of Card No. 90; Deck No. 98, if values are to be computed; Deck No. 29, and blank card.
- (e) Repeat the species file for each NF/WC/block/unit/cut or leave/ species group to be processed in this computer run.

4. Computer processing and computer output

- 4.1 Computer processing. The computer input decks ordered as in sections 3.31 and 3.32 are sent to the computer for processing. The input decks and the computer output will be returned.

4.2 Computer output

- 4.21 Printed output, if requested, will consist of tables 1 and 2 for each species file of input data. These tables should be checked to make certain that the volumes were summarized correctly by log grade and 4-inch d.i.b. group. Incorrect volume summaries indicate incorrect input data in the Deck No. 29 and perhaps incorrect control data in the card No. 90.
- 4.22 Punched output, if requested, will consist of either two or three decks of cards for each species file of input data. These decks are: (a) No. 44--Species/Log Grade Volume and Value Summary, and (b) No. 45--Species Volume and Value Summary, and also (c) No. 43--Species/Log Grade/d.i.b. Group Volume and Value Summary.

The punched output should be checked in a manner similar to that for the printed output. This can be done after the tables 3 and 4 are prepared.

- 4.23 Printing the punched output. The computer output Deck Nos. 43, 44, and 45 may be printed together as one combined deck of cards or each deck may be printed separately. In either case, the cards are separated into two sub-groups, one for utilized logs, and the other for unutilized logs. The cards should be in order by species/log grade/4-inch d.i.b. group.

1590-3002
TIMBER APPRAISAL

TABLE 3 - UTILIZED LOG SUMMARY DATA - NET VOLUME LOG SCALE AND LUMBER TALLY,
TOTAL VALUE AND AVERAGE VALUE PER M FT. LUMBER TALLY, AND AVERAGE
OVERRUN PERCENT BY SPECIES, LOG GRADE, AND F IN. DIB GROUP,
AND TOTALS AND AVERAGES BY LOG GRADE AND BY SPECIES.

NAT. FOR.	UNIT	W.C.	C/L	U/UN	ZONE	SP.	LOG GR.	IN. DIB	SCRIBNER NET VOL.	TOTAL NET VOLUME	TOTAL VALUE	AVG. VALUE M LT	AVG. OVER- RUN PCT.
1	1	7	1	1	3	11	1	7	LS 480	LT 432.48	LT 56.53		
								8	680	620.84	83.33		
								9	760	712.12	88.64		
									1920*	1765.44*	228.50*		
									1920	1765.44	228.50	119.01	.919
									*	*	*		
							2	5	290	288.55	24.36		
								6	760	716.68	77.75		
								7	2600	2342.60	306.20		
								8	6580	6007.54	806.38		
								9	4220	3954.14	492.18		
								10	2160	2023.92	251.92		
									16610*	15333.43*	1958.79*		
									16610	15333.43	1958.79	117.93	.923
									*	*	*		
							3	3	340	397.80	25.16		
								4	5580	6171.48	433.29		
								5	500	497.50	41.71		
									6420*	7066.78*	500.16*		
									6420	7066.78	500.16	77.91	1.101
									*	*	*		
							4	3	28340	33157.80	2071.94		
								4	150480	166430.88	11534.29		
								5	160030	159229.85	13080.85		
								6	117490	110793.07	10383.77		
								7	76450	68881.45	7382.01		
								8	22610	20642.93	2402.99		
								9	9560	8957.72	1109.15		
								10	2040	1911.48	236.68		
									567000*	570005.18*	48201.68*		
									567000	570005.16	48201.68	85.01	1.005
									*	*	*		
							7	4	140	154.84	10.73		
								5	230	228.85	18.80		
								6	370	348.91	32.70		
									740*	732.60*	62.23*		
									740	732.60	62.23	84.10	.990
									*	*	*		
									592690	594903.40	50951.36	85.97	1.004
									*	*	*		

1590-3002
TIMBER APPRAISAL

TABLE 4 - UNUTILIZED LOG SUMMARY DATA - NET VOLUME LOG SCALE BY SPECIES, LOG GRADE AND 4 IN. DIB GROUP, AND TOTALS BY LOG GRADE AND BY SPECIES.

NAT. FOR.	UNIT	W.C.	C/L	U/UN	ZONE	SP.	LOG GR.	4 DIB	IN. NET VOL. LS	SCRIBNER NET VOL. LT	TOTAL NET VOLUME LT	TOTAL VALUE LT	AVG. VALUE M LT	AVG. OVER- RUN PCT.
1	1	7	1	2	3	11	3	2	24690					
								3	11980					
								4	2350					
									39020*		*		*	
									39020					
									*		*		*	
							4	2	9460					
								3	34270					
								4	7010					
									50740*		*		*	
									50740					
									*		*		*	
							7	2	40					
								3	120					
									160*		*		*	
									160					
									*		*		*	
							9	2	1440					
								3	560					
								4	410					
								5	230					
								6	370					
								9	760					
									3770*		*		*	
									3770					
									*		*		*	
									93690					
									*		*		*	

4.231 Utilized log summary data: net volume log scale and lumber tally, total value and average value per M feet lumber tally, and average overrun percent by species, log grade, and 4-inch d.i.b. group; and totals and averages by log grade and by species. (Table 3 is an example of the summary prepared from the Deck Nos. 43, 44, and 45 for utilized logs.)

4.232 Unutilized log summary data: net volume log scale by species, log grade, and 4-inch d.i.b. group, and totals by log grade and by species. (Table 4 is an example of the summary prepared from the Deck Nos. 43, 44, and 45 for unutilized logs.)

5. Processing of data not run by computer

5.1 The data not processed by the computer may consist of the leave trees, snags, and sanitation trees for PP, SP, DF, WF, RF, and IC; all trees of tree basis species not having net volume taper tables; and the cut trees for DF, WF, and RF when the Fir Tree Deck No. 29X1 is prepared for these species as in section 2.2.

5.11 Tree basis species. Trees of species for which there are no net volume taper tables (species other than PP, SP, DF, WF, RF, and IC).

5.111 Cut volume. Select the cut trees of the tree basis species from the Tree Deck No. 29, order them by species and 2-inch d.b.h. class; and print Table 5--Cut volume of tree basis species by species and 2-inch d.b.h. class. This table is not illustrated.

5.112 Leave volume. The cards of the Tree Deck No. 29 for the leave trees, snags, and sanitation trees of the tree basis species will be combined with those of the log basis species and processed as in section 5.12.

5.12 Log basis species. The cards of the Tree Deck No. 29 for the leave trees, snags, and sanitation trees of the log basis species and the tree basis species will be combined; ordered by species and cut/leave; and used to prepare Table 6--Volume in leave trees, snags, and sanitation trees by species and cut/leave code. This table is not illustrated.

5.13 Fir Trees. Use the Fir Tree Deck No. 29X1 prepared in section 2.2, ordered by species and cut/leave, to prepare Table 7--Net utilized volume of fir trees by species and cut/leave code. This table is not illustrated.

6. Descriptions of card decks

6.1 Control decks

6.11 Species Control Deck No. 90. One card per species file.

<u>Card column</u>	<u>Field</u>	<u>Variable</u>	<u>Format</u>
1-2	Deck number	DECK	I2
3-7	Species control code ^{10/}	L	I5
8-12	Execution control code ^{11/}	KONT 1	I5
13-17	Output control code ^{12/}	KONT 2	I5
18-22	Log grade control code ^{13/}	MIN	I5
23-26	Blank columns	--	4X
27	Zone code ^{14/}	BLOCK	I5
28-80	Blank columns	--	--
<u>XPunches</u>	<u>12 punches</u>	<u>Decimal punches</u>	
None	None	None	

^{10/} Species control code-L: 1 = ponderosa pine; 2 = sugar pine; 3 = white and California red fir; 4 = Douglas-fir; 5 = incense-cedar.

^{11/} Execution control code-KONT 1: 0 = compute volume tables only; 1 = compute volume and value tables; 2 = compute volume and overrun tables; 3 = compute volume, value, and overrun tables.

^{12/} Output control code-KONT 2: 1 = print tables only; 2 = punch Deck Nos. 44 and 45; 3 = punch Deck Nos. 43, 44, and 45; 4 = print tables and punch Deck Nos. 43, 44, and 45.

^{13/} Log grade control code-MIN: 1, ..., 9, 10 = the number of log grades for which values are present in the Deck No. 98.

^{14/} Zone code-BLOCK: identifies the Mill Study for the Species.

11 - Ponderosa pine, L = 1

1 - 1934 Eastside Mill Study, MIN = 7

2 - Combined Standard 1925 and 1929, MIN = 5

3 - Challenge, MIN = 5

13 - Sugar pine, L = 2

2 - Combined Standard 1925 and 1929, MIN = 5

3 - Challenge, MIN = 5

31, 32 - White and Red fir, L = 3

1 - Dinuba 1954, MIN = 5

01 - Douglas-fir, L = 4

1 - Coast Range (PNW), MIN = 7

2 - Paskenta 1952, MIN = 5

3 - Other (Westside Index), MIN = 8

51 - Incense-cedar, L = 5

1 - All, MIN = 5

6.2 Master decks

6.21 Log and Tree Volume Master Deck No. 91. One card per site group/species/2-inch d.b.h. class/total log height.

<u>Card columns</u>	<u>Field</u>	<u>Format</u>
1-2	Deck number	I2
3	Zone	I1
4-5	Blank columns	2X
6	Site group	I1
7-8	Species	I2
9-11	2-inch d.b.h. class	I3
12-13	Total log height	I2
14-30	Blank columns	17X
31-64	Log net volumes by log position, Scribner Decimal C:	
	31-33 First (Butt)log	F3.0
	34-36 Second log	F3.0
	37-39 Third log	F3.0
	40-42 Fourth log	F3.0
	43-45 Fifth log	F3.0
	46-48 Sixth log	F3.0
	49-51 Seventh log	F3.0
	52-54 Eighth log	F3.0
	<u>55-57 Ninth log</u>	<u>F3.0</u>
	58-59 Tenth log	F2.0
	60-61 Eleventh log	F2.0
	<u>62-63 Twelfth log</u>	<u>F2.0</u>
	64 Thirteenth log	F1.0
65-66	Number of utilized logs	I2
67-76	Blank columns	10X
77-80	Tree total net volume, Scribner Decimal C	F4.0

<u>XPunches</u>	<u>12 punches</u>	<u>Decimal punches</u>
70 Control	None	None

6.22 Fir Tree Net Utilized Volume Deck No. 92. One card per site group/fir species/2-inch d.b.h. class/total log height/defect code.

6.22 Deck No. 92, continued

<u>Card columns</u>	<u>Field</u>	<u>Format</u>
1-2	Deck number	I2
3-5	Blank columns	3X
6	Site group	I1
7-8	Species	I2
9-11	2-inch d.b.h. class	I3
12-13	Total log height	I2
14-30	Blank columns	17X
31-32	Defect code	I2
33-76	Blank columns	44X
77-80	Fir tree net utilized volume, Scribner Decimal C	F4.0

<u>XPunches</u>	<u>12 punches</u>	<u>Decimal punches</u>
50 Control X Punch	None	None

6.23 Overrun Deck No. 95. One card per 4-inch d.i.b. group, a total of 20 cards per run.

<u>Card columns</u>	<u>Field</u>	<u>Format</u> ^{15/}
1-5	Ponderosa pine overrun	F5.0
6-10	Sugar pine overrun	F5.0
11-15	White and California red fir overrun	F5.0
16-20	Douglas-fir overrun	F5.0
21-25	Incense-cedar overrun	F5.0
26-76	Blank columns	51X
77-78	4-inch d.i.b group	I2
79-80	Deck number	I2

<u>XPunches</u>	<u>12 punches</u>	<u>Decimal punches</u>
1, 6, 11, 16, 21 signify negative overrun	None except in decimals	4, 9, 14, 19, 24

6.24 Log Net Volume Deck No. 97. One card per 1-inch d.i.b. class, a total of 80 cards per run.

<u>Card columns</u>	<u>Field</u>	<u>Format</u>
1-2	1-inch diameter class	I2
3-17	Net log scale for 16-foot logs, Scribner Decimal C:	
	3-5 Ponderosa pine	F3.0
	6-8 Sugar pine	F3.0
	9-11 White and red fir	F3.0
	12-14 Douglas-fir	F3.0
	15-17 Incense-cedar	F3.0
18-78	Blank columns	61X
79-80	Deck number	I2

^{15/} Decimal points and minus signs will be punched.

6.24 Deck No. 97, continued

<u>XPunches</u>	<u>12 punches</u>	<u>Decimal punches</u>
None	None	None

6.25 Average Value Deck No. 98. One card for each 4-inch d.i.b. group, a total of 20 cards for each species file.

<u>Card columns</u>	<u>Field</u>	<u>Format</u>
1-2	Deck number	I2
3-4	Zone	I2
5-6	Species	I2
7-8	4-inch d.i.b. group	I2
9-62	Average values by Log Grade ^{16/} :	
	9-14 Grade 0	F6.2
	15-20 Grade 1	F6.2
	21-26 Grade 2	F6.2
	27-32 Grade 3	F6.2
	33-38 Grade 4	F6.2
	39-44 Grade 5	F6.2
	45-50 Grade 6	F6.2
	51-56 Grade 7	F6.2
	57-62 Grade 8	F6.2
63-80	Blank columns	--

<u>XPunches</u>	<u>12 punches</u>	<u>Decimal punches</u>
None	None except in decimals	12, 18, 24, 30, 36, 42, 48, 54, 60

6.3 Data Decks

6.31 Tree Deck No. 29. One card for each tree of the timber appraisal cruise.

<u>Card columns</u>	<u>Field</u>	<u>Format</u>
1-2	Deck number	I2
3-4	Plot number	I2
5	Site class	I1
6	Site group	I1
7-8	Species	I2
9-11	2-inch d.b.h. class	I3
12-13	Total log height	I2
14-26	Log grades by log position:	
	14 First (Butt) log	I1
	15 Second log	I1
	16 Third log	I1
	17 Fourth log	I1

^{16/} The decimal points will be punched.

6.31 Deck No. 29, continued

<u>Card column</u>	<u>Field</u>	<u>Format</u>
	18 Fifth log	I1
	19 Sixth log	I1
	20 Seventh log	I1
	21 Eighth log	I1
	22 Ninth log	I1
	23 Tenth log	I1
	24 Eleventh log	I1
	25 Twelfth log	I1
	26 Thirteenth log	I1
27-28	Condition class	I2
29	Age class	I1
30	Cut/Leave code ^{17/}	I1
31-64	Log net volumes by log position, Scribner Decimal C:	
	31-33 First (Butt) log	F3.0
	34-36 Second log	F3.0
	37-39 Third log	F3.0
	40-42 Fourth log	F3.0
	43-45 Fifth log	F3.0
	46-48 Sixth log	F3.0
	49-51 Seventh log	F3.0
	52-54 Eighth log	F3.0
	55-57 Ninth log	F3.0
	58-59 Tenth log	F2.0
	60-61 Eleventh log	F2.0
	62-63 Twelfth log	F2.0
	64 Thirteenth log	F1.0
65-66	Number of utilized logs	I2
67-68	Unit	I2
69-70	National Forest	I2
71	Working circle	I1
72	Block	I1
73-74	Strip number	I2
75-76	Marking	I2
77-80	Tree total net volume Scribner Decimal C	F4.0

XPunches: 15 through 26 causes X skip to column 27;
and 34, 37, 40, 43, 46, 49, 52, 55, 58,
60, 62, or 64 signify no logs and volumes
from the X punched column through column 64.

12 punches: None.

Decimal punches: None

^{17/} Cut/Leave code: 1 = cut, 2 = leave.

6.32 Fir Tree Deck No. 29X1. One card for each DF, WF, and RF tree of the timber appraisal cruise.

<u>Card columns</u>	<u>Field</u>	<u>Format</u>
1-2	Deck number	I2
3-30	Same as Tree Deck No. 29, section 6.31	
31-32	Defect code	I2
33-66	Blank columns	34X
67-76	Same as Tree Deck No. 29, section 6.31	
77-80	Tree net utilized volume, Scribner Decimal C	F4.0

XPunches: 1 identifying punch; also same as Tree Deck No. 29, section 6.31.

12 punches: None Decimal punches: None

6.4 Summary decks

6.41 Species/Log Grade/DIB Group Volume and Value Deck No. 43. One card output per species file/utilization/log grade/4-inch d.i.b. group.

<u>Card columns</u>	<u>Field</u>	<u>Format</u>
1-2	Deck number	I2
3-4	Unit	I2
5-6	National Forest	I2
7	Working circle	I1
8	Zone	I1
9	Cut/Leave	I1
10	Utilized/unutilized	I1
11-12	Species	I2
13	Log grade	I1
14-15	4-inch d.i.b. group	I2
16-17	Low 1-inch d.i.b. of group	I2
18-19	High 1-inch d.i.b. of group	I2
20-28	Total net volume log scale, Scribner bd. ft.	F9.0
29-34	Blank columns	6X
35-46	Total value, lumber tally	F12.2
47-51	Blank columns	5X
52-63	Total volume bd. ft., lumber tally	F12.2
64-80	Blank columns	--

<u>XPunches</u>	<u>12 punches</u>	<u>Decimal punches</u>
None	None except in decimals	28, 32, 44, 48, 61

6.42 Species/Log Grade Volume and Value Deck No. 44.
One card output per species file/utilization/
log grade.

<u>Card columns</u>	<u>Field</u>	<u>Format</u>
1-2	Deck number	I2
3-4	Unit	I2
5-6	National Forest	I2
7	Working circle	I1
8	Zone	I1
9	Cut/Leave	I1
10	Utilization	I1
11-12	Species	I2
13	Log grade	I1
14-19	Blank columns	6X
20-28	Total net volume, log scale, Scribner bd. ft.	F9.0
29-34	Average value per M ft., lumber tally	6.2
35-46	Total value, lumber tally	F12.2
47-51	Average overrun factor	F5.3
52-63	Total volume, bd. ft., lumber tally	F12.2
64-80	Blank columns	--

<u>XPunches</u>	<u>12 punches</u>	<u>Decimal punches</u>
None	None except in decimals	28, 32, 44, 48, 61

6.43 Species Volume and Value Deck No. 45. One card
output per species file/utilization.

<u>Card columns</u>	<u>Field</u>	<u>Format</u>
1-2	Deck number	I2
3-4	Unit	I2
5-6	National Forest	I2
7	Working circle	I1
8	Zone	I1
9	Cut/Leave	I1
10	Utilized/unutilized	I1
11-12	Species	I2
13-19	Blank columns	7X
20-28	Total net volume log scale, Scribner board feet	F9.0
29-34	Average value per M feet, lumber tally	F6.2
35-46	Total value, lumber tally	F12.2
47-51	Average overrun factor	F5.3
52-63	Total volume, board feet, lumber tally	F12.2
64-80	Blank columns	--

XPunches

None

12 punchesNone except in
decimalsDecimal punches

28, 32, 44, 48, 61

7. Codes

The codes to use when recording data on the Timber Appraisal Cruise Record (Form R5-2400-28) are given in the "Instructions for Tallying and Transmitting Cruise Data for Processing by Region 5 Electric Accounting Machine Section" dated April 30, 1959, except as modified below.

- (1) Species. Code 11 must be used for Jeffrey pine.
 - (2) Log grade by log position.
 - Additional log grade codes are:
 - 0 Logs not graded (cut trees for species not graded, such as lodgepole pine)
 - 7 Sound logs in Douglas-fir and incense-cedar (in areas where other grades are not used)
 - 8 Sound logs in snags and sanitation trees.
 - (3) Cut/Leave. Complete cut/leave codes are:
 - 1 Cut
 - 2 Leave
 - 5 Sanitation trees
 - 6 Snags, unmerchantable
 - 7 Snags, merchantable
 - 9 Snags, merchantable and unmerchantable (used when codes 6 and 7 are not used)
- The use of codes 5, 6, and 7 is optional.

Miller, Robert M., and Roof, Sharon D.

1962. Automatic processing of timber appraisal cruises. U.S. Forest Serv. Pacific SW. Forest & Range Expt. Sta. Tech. Paper 74, 25 pp., illus.

An IBM 704 and 7090 FORTRAN MONITOR program has been designed to meet the needs of the timber appraiser for volume, value, and overrun of the species having net volume taper tables. Complete flexibility is maintained in processing by using the species file concept of program control during input, computing, and output. Data are input to the computer via punched cards and the summary data are output in printed and/or punched form for each species file. Summary tables of volume, value, and overrun factors are produced for the average appraisal in less than 4 minutes on the IBM 7090.

Miller, Robert M., and Roof, Sharon D.

1962. Automatic processing of timber appraisal cruises. U.S. Forest Serv. Pacific SW. Forest & Range Expt. Sta. Tech. Paper 74, 25 pp., illus.

An IBM 704 and 7090 FORTRAN MONITOR program has been designed to meet the needs of the timber appraiser for volume, value, and overrun of the species having net volume taper tables. Complete flexibility is maintained in processing by using the species file concept of program control during input, computing, and output. Data are input to the computer via punched cards and the summary data are output in printed and/or punched form for each species file. Summary tables of volume, value, and overrun factors are produced for the average appraisal in less than 4 minutes on the IBM 7090.

Miller, Robert M., and Roof, Sharon D.

1962. Automatic processing of timber appraisal cruises. U.S. Forest Serv. Pacific SW. Forest & Range Expt. Sta. Tech. Paper 74, 25 pp., illus.

An IBM 704 and 7090 FORTRAN MONITOR program has been designed to meet the needs of the timber appraiser for volume, value, and overrun of the species having net volume taper tables. Complete flexibility is maintained in processing by using the species file concept of program control during input, computing, and output. Data are input to the computer via punched cards and the summary data are output in printed and/or punched form for each species file. Summary tables of volume, value, and overrun factors are produced for the average appraisal in less than 4 minutes on the IBM 7090.

* NATIONAL AGRICULTURAL LIBRARY



1022501026